Tool for Collaborative Autonomy, Phase I

Completed Technology Project (2016 - 2016)



Project Introduction

Over the last 25 years, UAS have proven to be very valuable tools for performing a wide range of operations such as environmental disaster relief, search and rescue operations, wildfire suppression, multi-robot planetary exploration, Intelligence, Surveillance, and Reconnaissance (ISR), precision agriculture, and weather forecasting. Envisioned missions often involve executing several different activities, sometimes simultaneously, where agents (Unmanned air, sea surface, or ground vehicle) must coordinate and interact with each other to perform the requisite tasks. Agents within these networked teams are usually heterogeneous, possessing different resources and capabilities, and some agents are better suited to handle certain types of tasks than others? this leads to different roles and responsibilities within the mission. In other scenarios, independent vehicles, each with their own goals, must operate in the same space without interfering with one another . Ensuring proper coordination and collaboration between different agents is crucial to efficient and successful operations, motivating the development of autonomous planning methods for heterogeneous networked teams. Reducing the necessity for perfect communication is also critical. Since operations involve dynamic environments, with situational awareness and underlying models changing rapidly as new information is acquired, so planning strategies must be computationally efficient to adjust solutions in real time. We propose to develop the Tool for Collaborative Autonomy (TCA) that will provide an automated planning capability that routes assets to optimize overall airspace utilization (e.g. in traffic management scenarios) or operational effectiveness (e.g. in cooperative scenarios), and to ensure spatial and temporal deconfliction/synchronization of the team under dynamically changing environments while considering cost factors (e.g. fuel and time), available resources and network constraints.



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Organizational Responsibility

Responsible Mission Directorate:

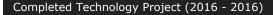
Space Technology Mission Directorate (STMD)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

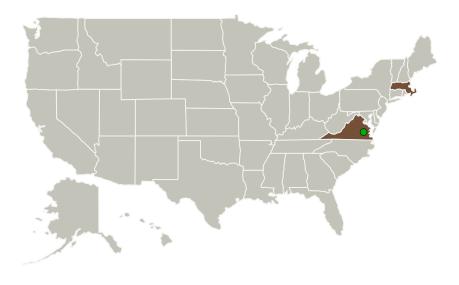


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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Туре	Location
Langley Research Center(LaRC)	Supporting	NASA	Hampton,
	Organization	Center	Virginia

Primary U.S. Work Locations	
Massachusetts	Virginia

Project Transitions

June 2016: Project Start

December 2016: Closed out

Closeout Documentation:

• Final Summary Chart(https://techport.nasa.gov/file/139527)

Project Management

Program Director:

Jason L Kessler

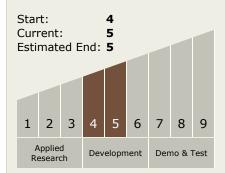
Program Manager:

Carlos Torrez

Principal Investigator:

Sachin Jain

Technology Maturity (TRL)



Technology Areas

Primary:

- TX10 Autonomous Systems
 - ☐ TX10.3 Collaboration and Interaction
 - ─ TX10.3.3 Goal and Task
 Negotiation

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System



Small Business Innovation Research/Small Business Tech Transfer

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Images



Briefing Chart Image

Tool for Collaborative Autonomy, Phase I (https://techport.nasa.gov/imag e/128690)



Final Summary Chart Image

Tool for Collaborative Autonomy, Phase I Project Image (https://techport.nasa.gov/imag e/126593)

